I.—STEAM PIPE SIZES FOR HEATING SYSTEMS.

Table I.—Flow of Steam in Pounds per Minute through Pipes 100 feet in Length.

Diameter of Pipe	Drop in Pressure (Pounds) in 100 feet Length of Pipe.								
	¼	½	¾	1	1½	2	3	4	5
1	0.44	0.63	0.78	0.91	1.1	1.3	1.7	2.0	2.3
1¼	0.81	1.2	1.4	1.7	2.1	2.4	3.0	3.6	4.1
1½	1.6	1.9	2.3	2.7	3.4	3.9	4.9	5.9	6.8
2	2.9	4.2	5.2	5.9	7.4	8.6	10.9	13.0	14.9
2½	5.3	7.5	9.3	10.8	13.4	15.6	19.7	23.4	26.9
3	8.6	12.3	15.2	17.6	21.8	25.4	32.0	31.8	43.7
3½	12.9	18.3	22.6	26.3	32.5	37.9	47.8	56.9	65.3
4	18.1	25.7	31.8	36.9	45.8	53.3	67.2	80.1	91.9
5	32.2	45.7	56.6	65.7	81.3	94.7	120.0	142.0	163.0
6	51.7	73.3	90.9	106	131	152	192	229	262
7	76.7	109	135	157	194	226	285	339	390
8	108	154	190	222	274	319	402	478	549
9	147	209	258	299	371	432	545	649	745
10	192	273	339	393	487	567	715	852	977
12	305	434	537	623	771	899	1130	1350	1550
15	535	761	942	1090	1350	1580	1990	2370	2720

Contributed by Chas. L. Hubbard.

II.—STEAM PIPE SIZES FOR HEATING SYSTEMS.

Table II.—Factors with which to multiply the figures obtained in Table I, for initial pressures over 10 pounds, to obtain the flow of steam in pounds per minute through pipes 100 ft in length.

Drop in Pressure (Pounds)	Initial Pressure (Pounds).					
	10	20	30	40	60	80
¼	1.27	1.49	1.68	1.84	2.13	2.38
½	1.26	1.48	1.66	1.83	2.11	2.36
1	1.24	1.46	1.64	1.80	2.08	2.32
2	1.21	1.41	1.59	1.75	2.02	2.26
3	1.17	1.37	1.55	1.70	1.97	2.20
4	1.14	1.34	1.51	1.66	1.92	2.14
5	1.12	1.31	1.47	1.62	1.87	2.09

Table III.—Factors with which to multiply the figures obtained in Table I, for length of pipe smaller or greater than 100 feet, to obtain the flow of steam in pounds per minute.

Feet	Factor	Feet	Factor	Feet	Factor	Feet	Factor
10	3.16	120	0.91	275	0.60	600	0.40
20	2.24	130	0.87	300	0.57	650	0.39
30	1.82	140	0.84	325	0.55	700	0.37
40	1.58	150	0.81	350	0.53	750	0.36
50	1.41	160	0.79	375	0.51	800	0.35
60	1.29	170	0.76	400	0.50	850	0.34
70	1.20	180	0.74	425	0.48	900	0.33
80	1.12	190	0.72	450	0.47	950	0.32
90	1.05	200	0.70	475	0.46	1000	0.31
100	1.00	225	0.66	500	0.45		
110	0.95	250	0.63	550	0.42		

Contributed by Chas. L. Hubbard.

III.—STEAM PIPE SIZES FOR HEATING SYSTEMS.

D'Arcy's formulas for flow of steam in pipes, used for calculating Table I.

$$Q = c\sqrt{\frac{(P-P_1)\,d^5}{wL}}, \qquad W = c\sqrt{\frac{w(P-P_1)\,d^5}{L}},$$

$$d = \sqrt[5]{\frac{c^2 w (P-P_1)}{W^2 L}}, \qquad P-P_1 = \frac{Q^2}{c^2}\frac{wL}{d^5},$$

Q = Cubic feet of steam per minute, $P-P_1$ = Drop in pressure,

W = Pounds of steam per minute, d = Diameter of pipe in inches,

w = Weight per cubic foot of steam at pressure P, L = Length of pipe, in feet,

P = Initial pressure, c = Constant.

P_1 = Terminal pressure,

Table IV.

Diameter of Pipe, Inches.	Value of Constant C.	5th. Power of d.
1	45.3	1
1½	48.5	6
2	52.7	32
2½	54.3	97
3	56.1	243
3½	57.1	523
4	57.8	1024
5	58.4	3125
6	59.5	7776
7	60.1	16807
8	60.7	32768
9	61.2	59049
10	61.8	100000

Contributed by Chas. L. Hubbard.

IV.—STEAM PIPE SIZES FOR HEATING SYSTEMS.

Table V.

Diameter of Pipe in Inches	Direct Radiation. Based on an efficiency of 300 heat units per square foot of radiating surface per hour and a drop in pressure of ¼ pound in 100 ft. length of pipe. Square feet of direct radiation.	Indirect Radiation. Based on an efficiency of 600 heat units per square foot of radiation per hour and a drop in pressure of ¼ pound in 100 ft. length of pipe. Square feet of indirect radiation.
1	60	40
1¼	100	72
1½	135	95
2	370	260
2½	670	475
3	1080	775
3½	1625	1160
4	2280	1620
5	4060	2900
6	6520	4660
7	9660	6900
8	13600	9720

Table VI.

Single Pipe Risers. Based on velocities of 10 and 15 feet per second.

Diam. of Riser	Square feet of direct radiation 10 feet per sec., velocity	Square feet of direct radiation 15 feet per sec., velocity
1	30	50
1¼	60	90
1½	80	120
2	130	200
2½	190	290
3	290	340
3½	390	590

Table VII.

Return Pipes.

Steam Pipe	Dry Return	Sealed Return
1	1	¾
1¼	1	1
1½	1¼	1
2	1½	1¼
2½	2	1½
3	2½	2
3½	2½	2
4	3	2½
5	3	2½
6	3½	3
7	3½	3
8	4	3½
9	5	3½
10	5	4

Contributed by Chas. L. Hubbard.

10	61.8	100000